

DISPLAY APPARATUS AND CONTROL METHOD OF THE DISPLAY APPARATUS

RELATED APPLICATION DATA

[0001] The present application claims priority to Japanese Patent Application JP 2009-276945, filed in the Japan Patent Office on Dec. 4, 2009, which is incorporated herein by reference in its entirety to the extent permitted by law.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a display apparatus and a control method of the display apparatus.

[0003] Recently, it has been important to ensure reliability of display elements in a display apparatus. Particularly, ensuring structural and mechanical reliability in terms of display performance is still a necessary item, which is the same as it was in the past.

[0004] For example, in Japanese Unexamined Patent Application Publication No. 2005-173193 as follows, in order to suppress a reduction in life-span of elements due to temperature increase due to the current amount, controlling a horizontal scanning line to be lit on or off so as to suppress overcurrent by using data, such as image data which can be used to determine a display state of a device, to determine circumstances of an image, is proposed as a technique.

[0005] However, in the technique disclosed in Japanese Unexamined Patent Application Publication No. 2005-173193, very complex control is performed to combine a gate signal and a source signal, and various feedback control operations such as controlling a lighting period are performed, so that many algorithms are used. Therefore, there is a problem in that manufacturing cost is increased in order to ensure reliability. In addition, control using complex algorithms results in an increase in power consumption of a driver IC, which generates degradation of power performance.

[0006] In Japanese Unexamined Patent Application Publication No. 2007-240617, a technique is disclosed for controlling optical characteristics such as the index of refraction by quantitatively detecting an amount of change of deformation due to a small force on a display apparatus, using an optical detecting unit of a polarization detecting device as a change in a polarized state of incident light.

[0007] In the technique disclosed in Japanese Unexamined Patent Application Publication No. 2007-240617, when there is light scattering in terms of relatively intensive external light from other light sources, for example sunlight or an indoor fluorescent light, or noise due to reflection of the external light, it is difficult to detect a small index of refraction caused by deformation.

SUMMARY OF THE INVENTION

[0008] Disclosed herein are one or more inventions that are capable of ensuring display reliability during curvature by performing display control in response to an amount of curvature when there is curvature in a display apparatus having flexibility.

[0009] In an embodiment, an apparatus includes a bendable substrate, light-emitting elements, and a sensor. The light-emitting elements are carried on the substrate. The sensor is configured to detect a bending of the substrate. The display controller is configured to control the light-emitting elements at least in part based upon the bending of the substrate, as detected by the sensor.

[0010] In an embodiment, a display apparatus includes a display unit and a display controller. The display unit has a display area to display at least one image. The display unit includes a bendable substrate, light-emitting elements carried on the substrate, and a sensor configured to detect bending of the substrate. The display controller controls said light-emitting elements at least in part based upon the bending of said substrate detected by the sensor.

[0011] In an embodiment, a display apparatus includes a display unit. The display unit has a display area to display at least one image. The display unit includes a bendable substrate, display elements, and a sensor. The substrate is configured to bend and flex into a number of different positions. The display elements are carried on the substrate. The sensor is configured to detect an amount of curvature of the substrate when it is bent. A size of the display area is controlled based upon the amount of curvature of the substrate. The display area comprises active display elements.

[0012] In an embodiment, a method includes detecting an amount of bending of a bendable substrate of a display unit, and controlling a size of a display area of active light-emitting elements at least in part based upon the bending of said substrate.

[0013] As described above, embodiments of the present invention are able to provide a display apparatus and a control method of the display apparatus capable of ensuring display reliability while bending and/or unbending a display apparatus by performing display control in response to an amount of curvature of a display apparatus having flexibility.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a plan view illustrating a front surface of a display apparatus according to an embodiment of the invention.

[0015] FIG. 2 is a diagram schematically illustrating a cross-section of the display apparatus.

[0016] FIG. 3 is a diagram illustrating an example in which a displacement sensor is provided on a rear surface of a display unit and illustrating a rear surface of the display apparatus in a plan view.

[0017] FIG. 4 is a diagram illustrating the example in which the displacement sensor is provided on the rear surface of the display unit and schematically illustrating a cross-section of the display apparatus.

[0018] FIG. 5 is a diagram illustrating a curved state of the display apparatus and schematically illustrating a state where the front surface on which the display unit is provided is curved to be a concave surface.

[0019] FIG. 6 is a diagram schematically illustrating a state where the surface on which the display unit is provided is curved to be a convex surface.

[0020] FIG. 7 is a block diagram illustrating a functional configuration of the display apparatus according to an embodiment.

[0021] FIG. 8 is a block diagram illustrating a functional configuration of a control unit according to an embodiment.

[0022] FIG. 9 is a diagram that graphically represents information corresponding to an example of an LUT for defining an image display area in response to an amount of change in resistance.

[0023] FIG. 10 is a diagram schematically illustrating another example of the LUT for defining a display area control amount.